Chandrayaan-2 PDS4 SPICE Archive User Manual

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This document describes the Chandrayaan-2 SPICE kernel dataset containing observation geometry and other ancillary data in the form of SPICE System kernels for the Chandrayaan-2 spacecraft. It describes the dataset directory structure, kernels included in the dataset and their naming conventions.

1 Introduction

SPICE (**S**pacecraft **P**lanet **I**nstrument **C**amera **E**vents), is an observation geometry information system to assist scientists in planning and interpreting scientific observations from space-based instruments aboard the spacecraft. All the necessary dynamic information required to process the scientific observations from Chandrayaan-2 are generated as part of the ground segment/Level-0 processes. They are further reviewed, archived and submitted for the publication in the form of a SPICE PDS4 bundle. This archive/bundle includes the set of Chandrayaan-2 SPICE data files (kernels), which can be accessed using SPICE software. In particular these SPICE kernels provide spacecraft ephemeries, spacecraft attitude and data needed for relevant time conversions. Data in the SPICE kernels must be accessed using the software called the SPICE Toolkit which is produced and distributed by the Navigation and Ancillary Information Facility (NAIF). This archive includes data covering from September 2019 upto February 2020 for the Chandrayaan-2 spacecraft. The next section will brief about the different types of SPICE kernels in this archive.

2 Kernel Details

Different types of SPICE kernels are used for storing different kinds of ancillary data. Accordingly, this Archive also contains different types of SPICE kernels providing different kinds of Spacecraft data such as Spacecraft ephemeris, spacecraft attitude, data needed for relevant time conversions etc. The following subsections provide brief details of the various kernel types present in this Archive

2.1 Spacecraft Planet Kernel (SPK)

SPK files contains the ephemeries data for the Chandrayaan-2 spacecraft. SPK files are located in the spice/spk directory. XML labels for all SPK kernels are also provided in the same directory.

Note that the NAIF assigned object id for Chandrayaan-2 is -152. The naming convention followed for SPK files as part of this PDS4 archive is

ch2_orb_DDMMMYYYY_ddmmmyyyy_vX.bsp, where,

DDMMMYYYY - start date of SPK data
ddmmmyyyy - end date of SPK data
X - version number of the data

The kernels follow 3-character alphabetic month notation and 4-character year notation.

2.2 Camera-Matrix Kernel (CK)

CK files contain time varying attitude data for the Chandrayaan-2 spacecraft. CK files are located in the spice/ck directory. XML labels for all CK kernels are also provided in the same directory. The naming convention followed for CK files as part of this PDS4 archive is

ch2_att_DDMMMYYYY_ddmmmyyyy_vX.bsp, where,

DDMMMYYYY - start date of CK data
ddmmmyyyy - end date of CK data
X - version number of the data

The kernels follow 3-character alphabetic month notation and 4-character year notation.

2.3 Spacecraft Clock Kernel (SCLK)

SCLK files contain on-board clock calibration data required to perform a transformation between Ephemeris time (ET) and spacecraft on-board time (SCLK). SCLK file is located under the directory spice/sclk of this archive. XML label for the SCLK file is also provided in the same directory. Naming convention followed for SCLK files as part of this PDS4 archive is

ch2_sclk_vX.tsc, where,

X - version number of the data

2.4 Other Kernels

Apart from the above mentioned kernels, this archive also contains the Leapseconds Kernel (LSK) and the Planetary Constants Kernel (PCK) along with their XML label files. The LSK Kernel file (along its corresponding XML label) is avaliable in spice/lsk directory and PCK Kernel file (along its corresponding XML label) is avaliable in spice/lsk directory.

LSK files contain the leapseconds and the values of other constants required to perform a transformation between Universal Time Coordinated (UTC) and Ephemeris time (ET). PCK files contain physical, dynamical and cartographic constants for target bodies. More details about these two kernels can be refered from the NAIF website